OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **DORRS POND** the program coordinators recommend the following actions.

We are pleased to welcome the Manchester Urban Ponds Restoration Project to the New Hampshire Volunteer Lake Assessment Program. Manchester's volunteers collected a lot of samples this summer and we applaud them for their efforts. Although it takes a few years to establish lake quality trends, we hope that this project will encourage the citizens of the city to continue their active participation in sampling and help to reverse the degraded conditions of the ponds. We encourage the Project Coordinator to establish a wet weather sampling program in the future. Samples collected during rain events allow us to determine non-point sources of pollution to the lake. Since the project's goals include restoring the quality of the urban ponds and reducing pollutant loads data collected from wet weather sampling allows biologists to better evaluate phosphorus loading to the lake.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a, also a measure of algal abundance, in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. Chlorophyll concentrations have shown an increase since 1996. Keep in mind that only two years of data have been gathered, with a gap of three years between them. Chlorophyll-a concentrations are above the state mean; concentrations greater than 16 mg/m^3 are considered nuisance levels. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are internal and external sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows that clarity is lower than it was in 1996. Again, only two years of data have been collected. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than the 1996 sample year. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity. Efforts should be made to stabilize stream banks, lake shorelines, and disturbed soils in the watershed. Guides to Best Management Practices are available from the NHDES upon request.

➢ Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. Phosphorus concentrations in the epilimnion increased over the course of the 2000 season. Epilimnetic and hypolimnetic values were both highly elevated from the 1996 values. Turbidity, or the amount of suspended solids in the water, was measured to be fairly high. Shallow lakes that mix readily are usually more turbid than deeper, stratified lakes. Turbidity can also be caused at the sample site by the anchor or sampling equipment. Please take care when collecting the deepest sample; if sediment is apparent in the Kemmerer bottle try sampling on the opposite side of the boat from the anchor. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

➢ Conductivity levels throughout the watershed were high this year. Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity. It would be useful to determine the sources of increased conductivity as we continue to monitor the lake. Bracketing the streams will be a tool for pinpointing these sources.

➢ The dinoflagellate *Ceratium* was the most dominant species in July. By August, *Ceratium* was exceeded in dominance by the diatom *Asterionella.* Dinoflagellates are usually indicative of nutrient-rich systems.

➢ Dissolved oxygen was relatively high at all depths of the lake in August and October (Table 9). In lakes that stratify, oxygen is depleted in the lower layer by the process of decomposition. This is a very shallow lake that is highly mixed due to wind and currents, therefore oxygen levels are expected to remain relatively high throughout the year.

- Lessard Inlet has extremely high phosphorus concentrations (Table 8) and turbidity (Table 11). Bracketing this stream would be an effective way to discover the sources of pollution.

NOTES

- Monitor's Note (7/26/00): Brownish water color; sprinkled rain sporadically. Tributary samples taken. Ducks at beach.

- Monitor's Note (8/28/00): Stagnant water at East Inlet I and Juniper Street Inlets.

- Monitor's Note (10/18/00): Rain yesterday and today. Currently raining lightly.

USEFUL SOURCES

What Can You Do To Prevent Soil Erosion?, WD-BB-30, NHDES Fact Sheet. (603) 271-3503 or www.state.nh.us

Lake Eutrophication, *WD-BB-3*, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Effects of Phosphorus on New Hampshire's Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Stormwater Management and Erosion and Sediment Control Handbook. NHDES, Rockingham County Conservation District, USDA Natural Resource Conservation Service, 1992. (603) 772-4385.

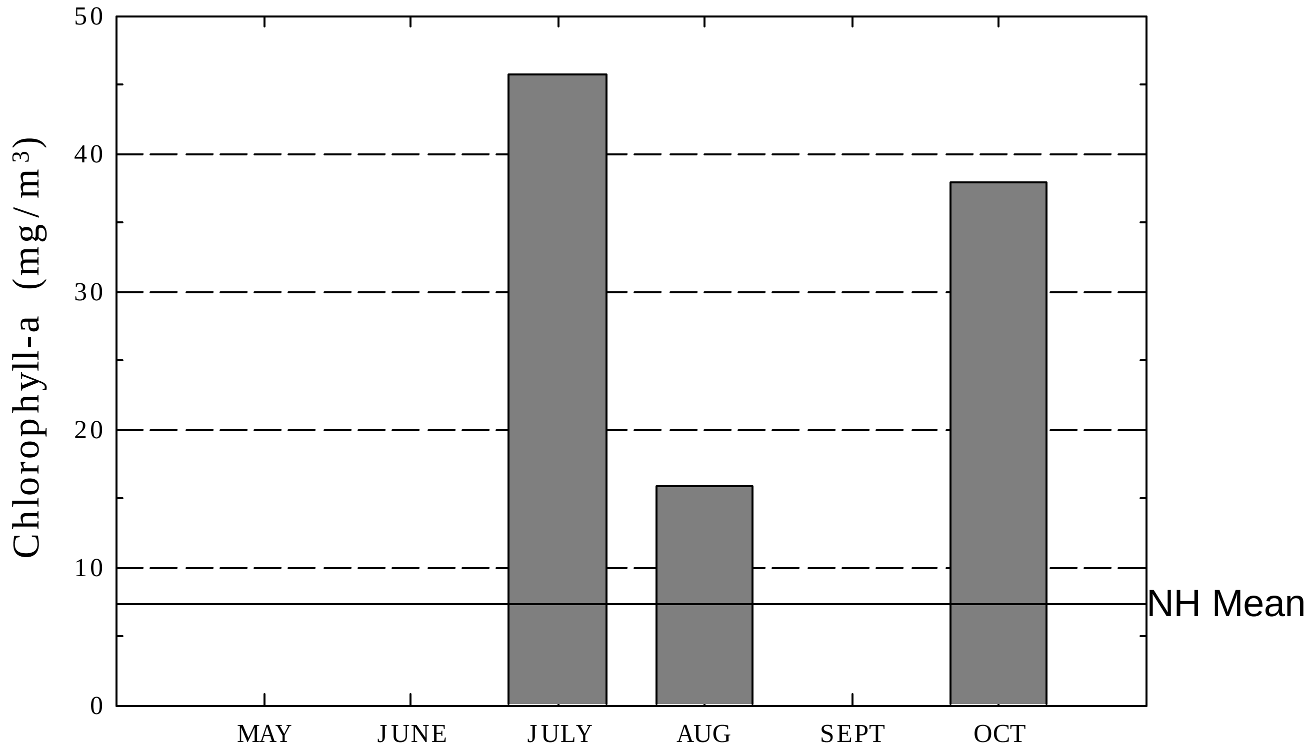
Proper Lawn Care Can Protect Waters, WD-BB-31, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Anthropogenic Phosphorus and New Hampshire Waterbodies, NHDES-WSPCD-95-6, NHDES Booklet, (603) 271-3503

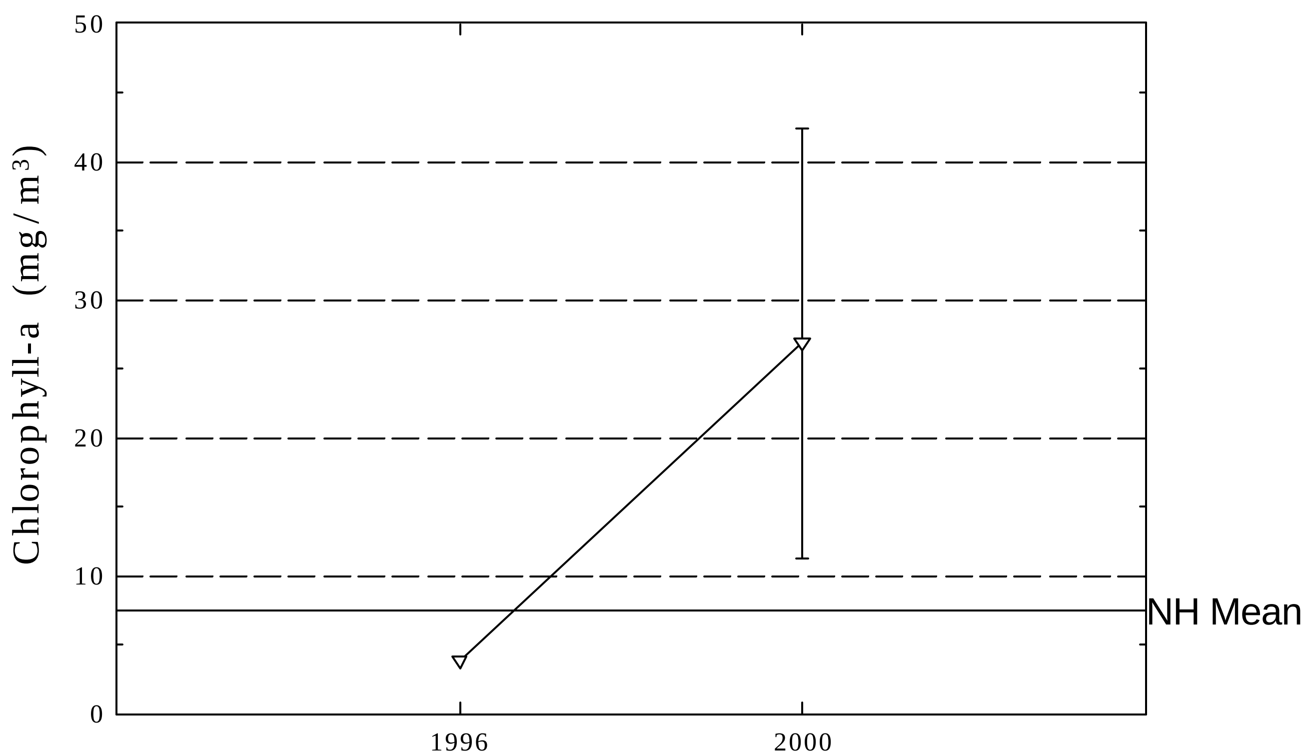
Nonpoint Source Pollution and Stormwater Fact Sheet Package. Terrene Institute. (703) 661-1582.

Dorrs Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



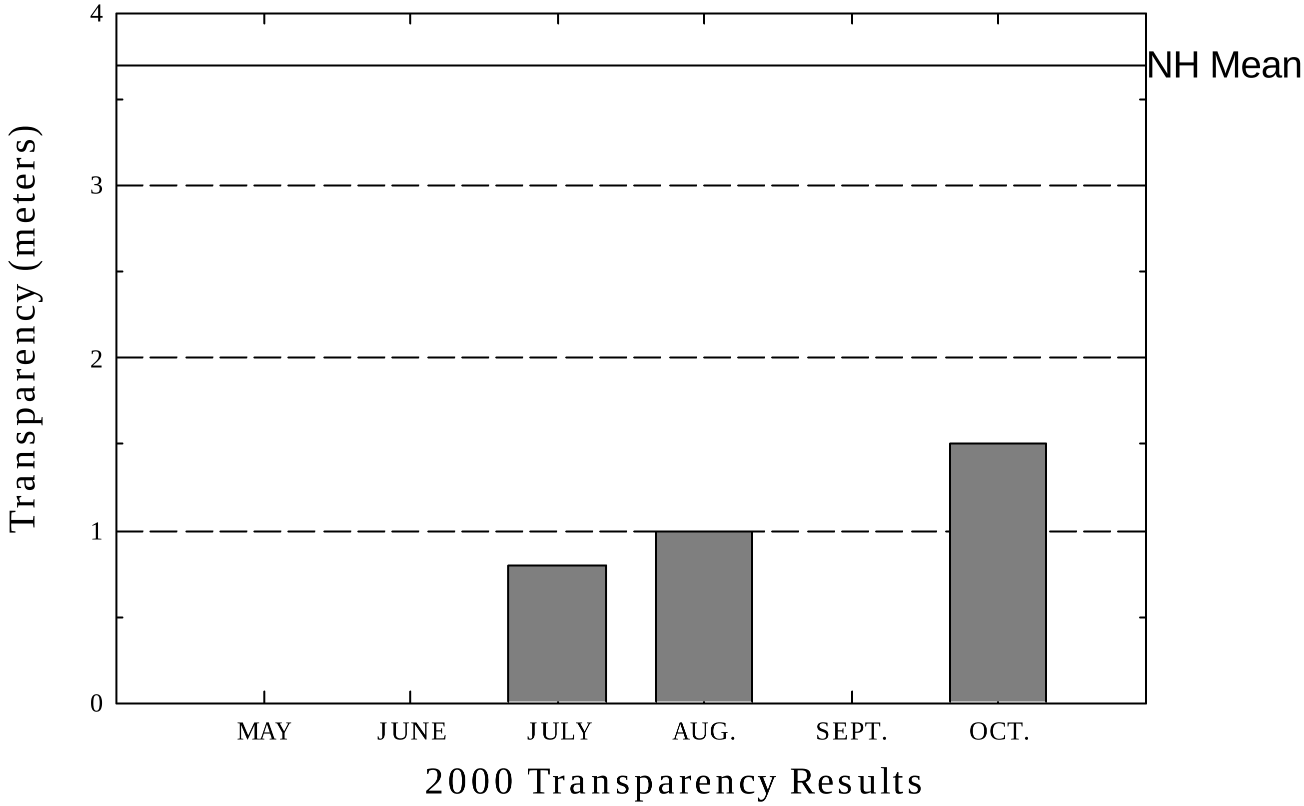
2000 Chlorophyll-a Results

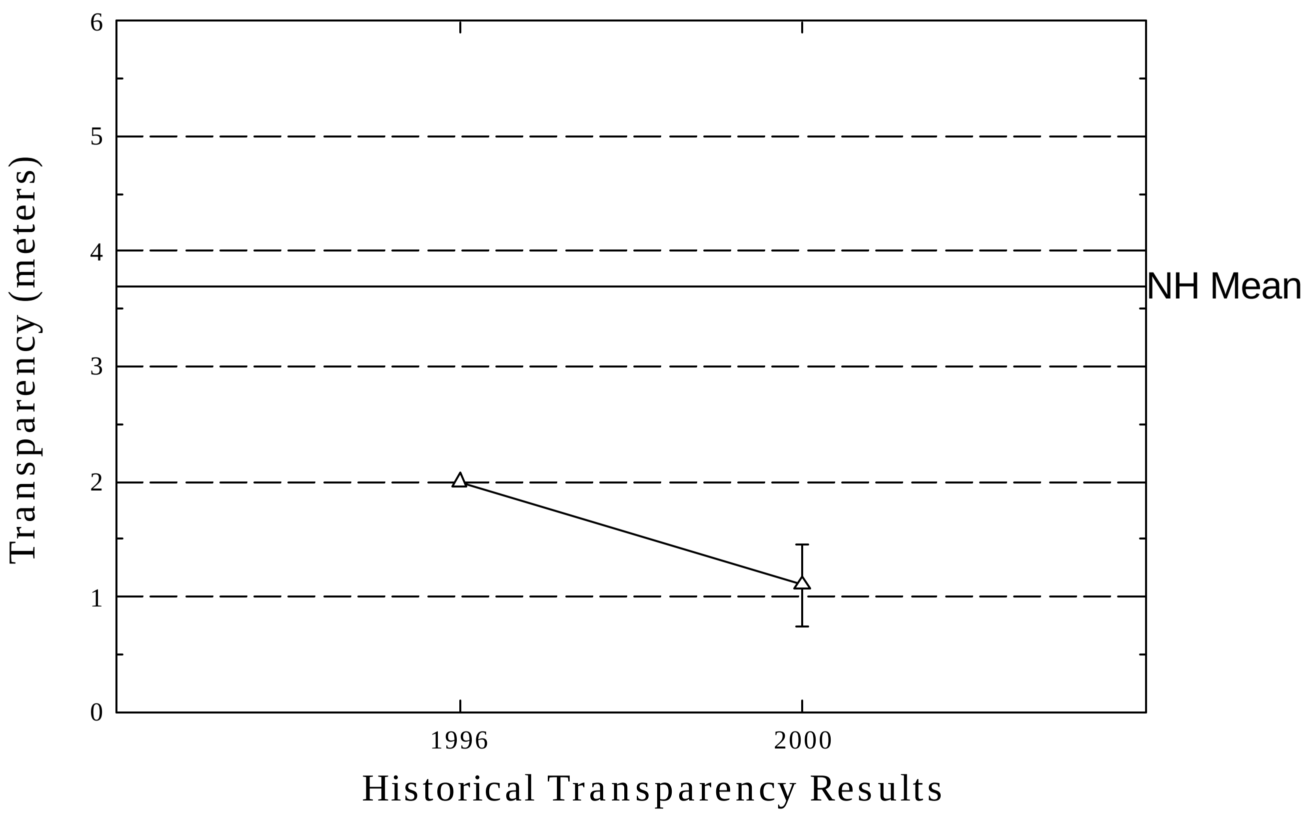


Historical Chlorophyll-a Results

Dorrs Pond

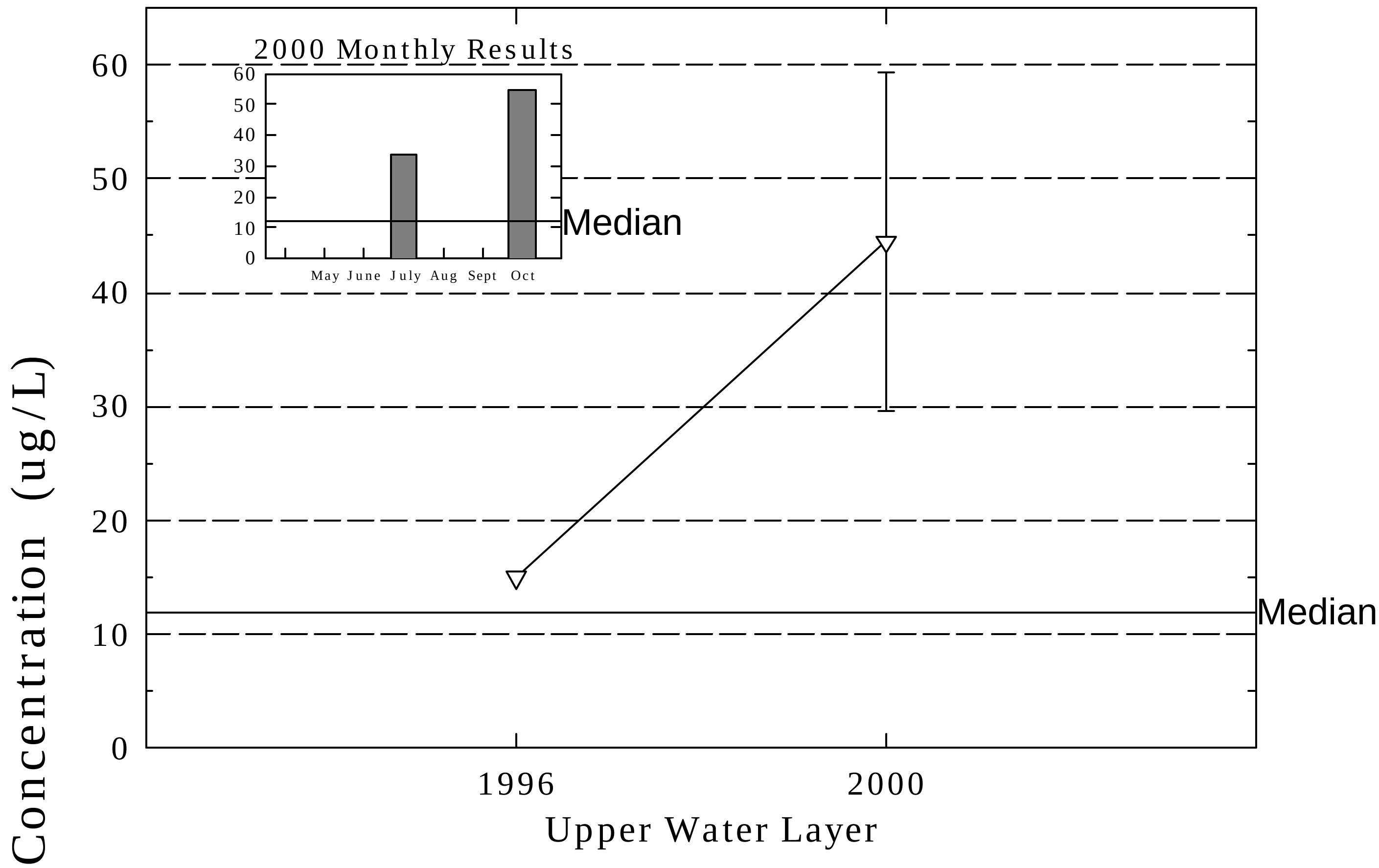
Figure 2. Monthly and Historical Transparency Results





Dorrs Pond

Figure 3. Monthly and Historical Total Phosphorus Data.



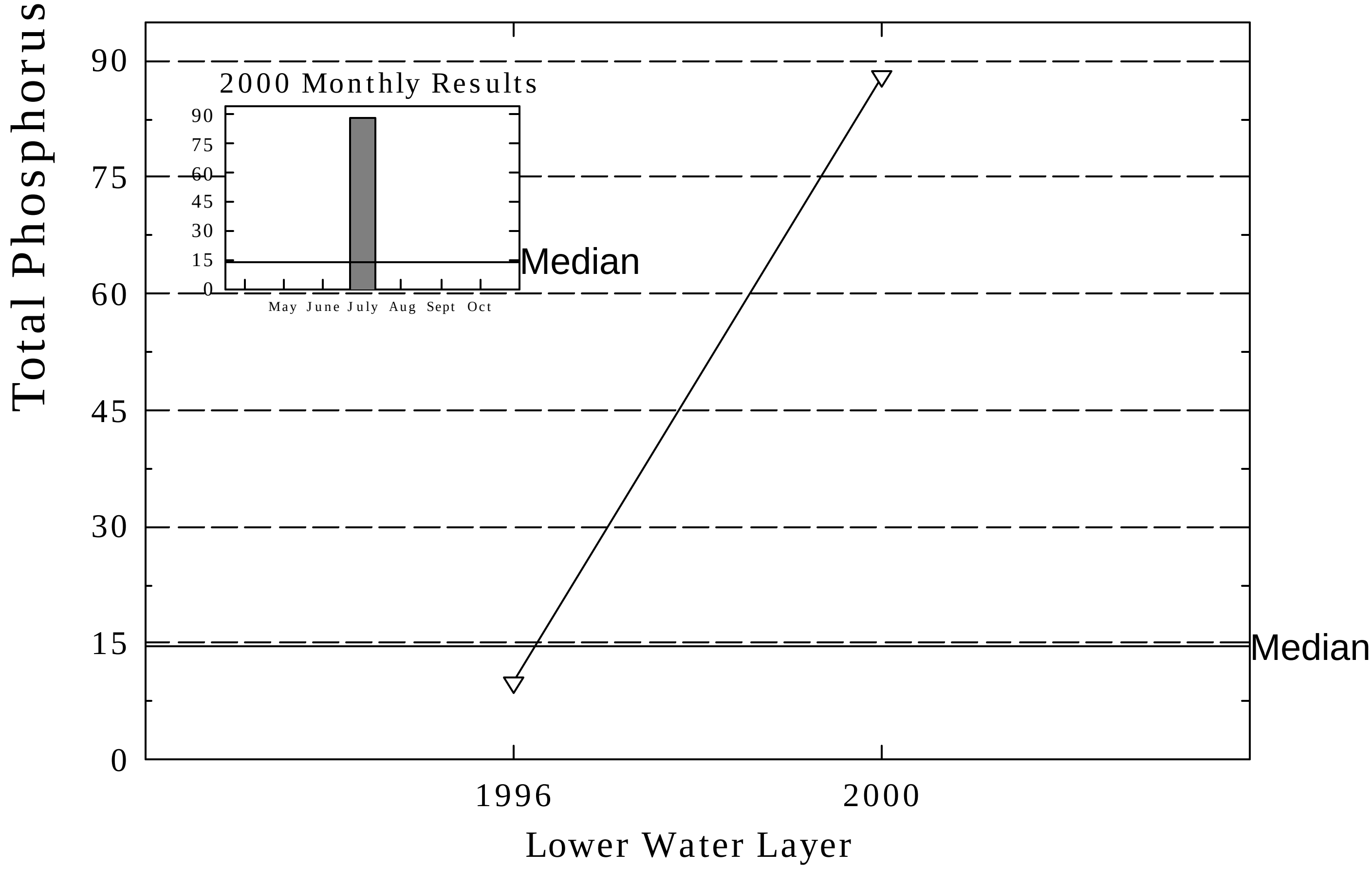


Table 1.

DORRS POND

MANCHESTER

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
2000	15.86	45.81	33.18

Table 2.

DORRS POND

MANCHESTER

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07 / 26 / 2000	CERATIUM	100
08 / 28 / 2000	ASTERIONELLA	35
	CERATIUM	30
	DINOBRYON	22
10 / 18 / 2000	ASTERIONELLA	73
	MALLOMONAS	14
	DINOBRYON	13

Table 3.

DORRS POND

MANCHESTER

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
2000	0.8	1.5	1.1

Table 4.

DORRS POND
MANCHESTER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
DAM OUTLET				
	2000	6.98	7.52	7.17
EAST I INLET				
	2000	6.88	6.88	6.88
EAST II INLET				
	2000	7.10	7.45	7.28
EPILIMNION				
	1996	6.61	6.61	6.61
	2000	7.06	7.42	7.20
HYPOLIMNION				
	1996	6.44	6.44	6.44
	2000	6.74	6.74	6.74
JUNIPER ST INLET				
	1996	6.19	6.19	6.19
	2000	6.38	6.38	6.38
LESSARD INLET				
	2000	6.88	7.14	6.99
LESSARDS BK UPSTREAM				
	1996	6.45	6.45	6.45

Table 4.

DORRS POND

MANCHESTER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
LESSARDS BK				
	1996	6.59	6.59	6.59

Table 5.

DORRS POND

MANCHESTER

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1996	9.40	9.40	9.40
2000	13.30	19.00	16.15

Table 6.

DORRS POND
MANCHESTER

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
DAM OUTLET				
	2000	388.0	475.0	430.2
EAST I INLET				
	2000	582.0	582.0	582.0
EAST II INLET				
	2000	465.0	906.0	646.7
EPILIMNION				
	1996	410.2	410.2	410.2
	2000	389.0	427.0	408.0
HYPOLIMNION				
	1996	409.2	409.2	409.2
	2000	432.0	432.0	432.0
JUNIPER ST INLET				
	1996	611.6	611.6	611.6
	2000	531.0	531.0	531.0
LESSARD INLET				
	2000	354.0	479.0	414.2
LESSARDS BK UPSTREAM				
	1996	375.2	375.2	375.2
LESSARDS BK				
	1996	489.7	489.7	489.7

Table 8.

DORRS POND
MANCHESTER

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
DAM OUTLET				
	2000	32	66	41
EAST I INLET				
	2000	9	9	9
EAST II INLET				
	2000	26	58	42
EPILIMNION				
	1996	15	15	15
	2000	34	55	44
HYPOLIMNION				
	1996	10	10	10
	2000	88	88	88
JUNIPER ST INLET				
	1996	9	9	9
	2000	8	8	8
LESSARD INLET				
	2000	81	296	170
LESSARDS BK UPSTREAM				
	1996	8	8	8
LESSARDS BK				
	1996	27	27	27

Table 9.

DORRS POND

MANCHESTER

Current year dissolved oxygen and temperature data.

Depth (meters)	**Temperature** (celsius)	**Dissolved Oxygen** (mg/L)	**Saturation** (%)
July 26, 2000			
0.1	23.5	8.6	101.0
1.0	22.8	8.0	93.0
2.0	19.9	0.3	3.0
August 22, 2000			
0.1	34.1	6.8	96.0
1.0	24.2	6.2	73.0
2.0	30.7	6.0	78.0
October 18, 2000			
0.1	11.4	7.5	68.0
1.0	11.4	7.0	65.0
2.0	11.4	6.7	62.0
2.5	11.5	5.1	47.0

Table 10.

DORRS POND

MANCHESTER

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	**Depth** (meters)	**Temperature** (celsius)	**Dissolved Oxygen** (mg/L)	**Saturation** (%)
July 26, 2000	2.0	19.9	0.3	3.0
August 22, 2000	2.0	30.7	6.0	78.0
October 18, 2000	2.5	11.5	5.1	47.0

Table 11.

DORRS POND
MANCHESTER

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
DAM OUTLET				
	2000	2.2	3.7	2.8
EAST I INLET				
	2000	1.0	1.0	1.0
EAST II INLET				
	2000	0.9	5.1	3.0
EPILIMNION				
	2000	3.3	4.2	3.7
HYPOLIMNION				
	2000	8.1	8.1	8.1
JUNIPER ST INLET				
	2000	0.9	0.9	0.9
LESSARD INLET				
	2000	1.4	10.0	5.3